

**CLAIMS**

1. Integrated device for transmitting millimetre waves comprising

- a laser circuit (13) able to generate optical signals;  
5 - a photodiode circuit (17) connected to said laser circuit (13) by means of a waveguide (14) and able to convert said optical signals into electromagnetic signals to be transmitted in the form of millimetre waves;

characterised by

10 - an amplifier circuit (15) associated to said waveguide (14) and able to apply modulation signals to said optical signals.

2. Device as claimed in claim 1, characterised in that said amplifier circuit (15) is able to modulate in amplitude said optical signals.

15 3. Device as claimed in claim 1 or 2, characterised in that said amplifier circuit (15) comprises

- modulating elements (10a, 16a) able to modulate said optical signals by means of a current ( $I_e$ ) proportional to said modulation signals.

20 4. Device as claimed in claim 3 characterised in that said modulating elements (10a, 16a) are digital.

5. Device as claimed in claim 3 characterised in that said modulating elements (10a, 16a) are analogue.

25 6. Integrated device for receiving millimetre waves, characterised by:

- a laser circuit (13) able to generate optical signals;  
- a photodiode circuit (27) connected to said laser circuit (13) by means of a waveguide (20) and comprising  
- receiving elements (40a, 40b) able to receive millimetric waves;  
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- circuit elements (19, 21) able to extract said millimetric waves.

7. Device as claimed in claim 6, characterised in that said millimetric waves comprise a modulating component and in that

said circuit elements (19, 21) comprise demodulating elements able to extract said modulating component.

8. Device as claimed in claim 7 characterised in that said demodulating elements comprise

5       - biasing elements (19, 21) able to bias said photodiode circuit (27) in conditions of non linearity, and

      - detecting elements (19, 21) associated to said biasing elements (19, 21) and able to detect said modulating component.

10   9. Device as claimed in claim 8, characterised by

      - an amplifier circuit associated to said waveguide (20) and able to co-operate with said biasing elements (19, 21) to bias said photodiode circuit (27).

15   10. Device as claimed in claim 8 or 9 characterised in that said biasing elements (19, 21) are able to bring to slight direct bias said photodiode circuit (27) by means of a voltage of 200 to 300 mV.

20   11. Device as claimed in any of the claims from 7 to 10, characterised in that said demodulating elements comprise circuit elements able to effect an optical beat with the optical signals generated by said laser circuit (13) and to generate electrical signals representative of said modulating component.

25   12. Integrated device for the reception and transmission of millimetric waves characterised by

      - at least one laser circuit (13) able to generate optical signals;

30       - a first photodiode circuit (17) connected to said at least one laser circuit (13) by means of a first waveguide and having transmission elements able to transmit said optical signals in the form of millimetric waves; and

      - a second photodiode circuit (27) connected to said at least one laser circuit (13) by means of a second waveguide and having receiving elements able to receive millimetric waves.

13. Device as claimed in claim 12, characterised by

- an amplifier circuit (15) associated to said first waveguide and able to apply modulating signals to said optical signals.

5 14. Device as claimed in claim 13, characterised in that said amplifier circuit (15) is able to modulate in amplitude said optical signals.

15. Device as claimed in claim 12, characterised in that said second photodiode circuit (27) comprises biasing elements  
10 able to bias said second photodiode circuit (27) in conditions of non linearity.

16. Device as claimed in claim 11 or 15, characterised by  
- an amplifier circuit (25) associated to said second waveguide and able to co-operate with said biasing elements  
15 (19, 21) to bias said second photodiode circuit (27).

17. Device as claimed in any of the claims from 12 to 16, characterised in that said first photodiode (17) and said second photodiode (27) are connected in parallel to antenna devices (40a, 40b).

20 18. Device as claimed in any of the claims from 12 to 16, characterised in that said at least one laser circuit (13) comprises coupling elements (50) able to couple said laser circuit (13) respectively to said first and to said second waveguide.

25 19. Module for transmitting millimetric waves comprising  
- an integrated device (1) having at least one laser circuit (13) able to generate optical signals;  
characterised by

- a modulating circuit (60) able to generate modulating  
30 signals (IN-MOD); and in that said integrated device (1) comprises

- a modulating element (15) able to apply said modulation signals to said optical signals.

20. Module for transmitting millimetric waves as claimed in claim 19, characterised in that

- said optical signals comprise at least two optical modes; and in that

5 - said millimetric waves are generated by beat between said two optical modes.

21. Module for receiving millimetric waves for cooperation with the module as claimed in claim 19, characterised by

- an integrated device having

10 - at least one laser circuit (13) able to generate optical signals;

- a photodiode circuit (27) connected to said laser circuit (13) and able to receive millimetric waves having a modulating component (OUT-MOD); and by

15 - a demodulation circuit connected to said photodiode circuit (27) and able to reveal said modulating component.

22. Module for the transmission and reception of millimetric waves characterised by

20 - a modulation circuit (60) able to generate modulating signals (IN-MOD);

- an integrated device (1) having

- at least one laser circuit (13) able to generate optical signals;

25 - a modulating element (15) able to apply said modulating signals to said optical signals;

- a photodiode circuit (27) connected to said least one laser circuit (13) and able to receive millimetric waves having a modulating component (OUT-MOD); and by

30 - a demodulating circuit connected to said photodiode circuit (27) and able to reveal said modulating component.

23. Method for transmitting millimetre waves comprising the step of

- generating optical signals;

characterised by the steps of

- generating modulating signals corresponding to useful information to be transmitted; and
- applying said modulating signals to said optical signals.

24. Method for receiving millimetric waves characterised by the steps of

- generating optical signals by means of a laser circuit (13);
- receiving, by means of a photodiode circuit (27) connected to said laser circuit (13) millimetric waves having a modulating component (OUT-MOD).

25. Method for receiving millimetric waves according to claim 24, characterised by the additional step of

- demodulating said modulating component by means of a demodulating circuit.

26. Local area network for exchanging information by means of millimetric waves, characterised in that it comprises alternatively:

- at least one module for transmitting millimetric waves as claimed in claim 19; and/or
- at least one module for receiving millimetric waves as claimed in claim 21; and/or
- at least one module for transmitting and receiving millimetric waves as claimed in claim 22.